RGV100BL

High-Speed Precision Rotation Stage

Newport®
Experience | Solutions

USER'S MANUAL

Precision Motion – *Guaranteed*™

Warranty

Newport Corporation warrants this product to be free from defects in material and workmanship for a period of 1 year from the date of shipment. If found to be defective during the warranty period, the product will either be repaired or replaced at Newport's discretion.

To exercise this warranty, write or call your local Newport representative, or contact Newport headquarters in Irvine, California. You will be given prompt assistance and return instructions. Send the instrument, transportation prepaid, to the indicated service facility. Repairs will be made and the instrument returned, transportation prepaid. Repaired products are warranted for the balance of the original warranty period, or at least 90 days.

Limitation of Warranty

This warranty does not apply to defects resulting from modification or misuse of any product or part.

CAUTION

Warranty does not apply to damages resulting from:

- **Incorrect usage:**
  - **Load on the stage greater than maximum specified load.**
  - **Carriage speed higher than specified speed.**
  - **Improper grounding.**
    - ¬ **Connectors must be properly secured.**
    - ¬ **When the load on the stage represents an electrical risk, it must be connected to ground.**
  - **Excessive or improper cantilever loads.**
- **Modification of the stage or any part thereof.**

CAUTION

Please return equipment in the original (or equivalent) packing.

You will be responsible for damage incurred from inadequate packaging if the original packaging is not used.

This warranty is in lieu of all other warranties, expressed or implied, including any implied warranty of merchantability or fitness for a particular use. Newport Corporation shall not be liable for any indirect, special, or consequential damages.

No part of this manual may be reproduced or copied without the prior written approval of Newport Corporation.

This manual has been provided for information only and product specifications are subject to change without notice. Any changes will be reflected in future printings.

Table of Contents

Warranty ii
EC Declaration of Conformity v
Definitions and Symbols vi
Warnings vii
Cautions viii

1.0 — Introduction 1

2.0 — Description 2
2.1 Design Details 2

3.0 — Characteristics 3
3.1 Definitions 3
3.2 Mechanical Specifications 4
3.3 Load Characteristics and Stiffness 4
3.4 Stage Weight 4

4.0 — Drive 5

5.0 — Motor 5
5.1 UE92BL DC-Motor Characteristics 5
5.2 Motor/Bearings Device Characteristics 5
5.3 Sensor Position 5
5.4 Feedback Signal Position 6
5.5 Pinouts 6
Encoder Connector (SUB-D15M) 6
Motor & Limits Connector (SUB-D15F) 7
SUB-D9M Connector of the Motor & Limits Cable 7
SUB-D9F Connector of the Motor & Limits Cable 7

6.0 — Connection to Newport Controllers 8
6.1 Warnings on Controllers 8
6.2 Connection 9
6.3 Cables 9
6.4 Configuration 10

7.0 — Connection to Non-Newport Electronics 10
7.1 Connections 10
7.2 Configuration 11
Driver Configuration 11
Controller Configuration 13

8.0 — Dimensions 15

9.0 — Maintenance 16
9.1 Maintenance 16
9.2 Repair 16
9.3 Calibration 16

Service Form 17

EC Declaration of Conformity

RGV100BL

EC Declaration of Conformity

following Annex II-1A
of Directive 2006/42/EC on machinery

Newport
Experience | Solutions

The manufacturer:

MICRO-CONTROLE Spectra-Physics,
9, rue du bois sauvage
F-91055 Evry FRANCE

Hereby declares that the machinery:

- Description: " RGV100BL "
- Function: High-Speed Precision Rotation Stage
- Models: RGV100BL

– the technical file of which was compiled by:

Mr Dominique DEVIDAL, Quality Director,
MICRO-CONTROLE Spectra-Physics, Zone Industrielle - B.P.29
F-45340 Beaune La Rolande France

– complies with all the relevant provisions of the Directive 2006/42/EC on machinery.
– complies with all the relevant provisions of the Directive 2014/30/EU relating to electro-magnetic compatibility.

– was designed and built in accordance with the following harmonised standards:

- NF EN 61326-1:2013 « Electrical equipment for measurement, control and laboratory use – EMC requirements – Part 1: General requirements »
- NF EN 55011:2010/A1:2011 Class A

– was designed and built in accordance with the following other standards:

- NF EN 61000-4-2
- NF EN 61000-4-3
- NF EN 61000-4-4
- NF EN 61000-4-6

ORIGINAL DECLARATION

Done in Beaune La Rolande on 26 June 2015
Dominique DEVIDAL
Quality Director

DC1-EN rev:A

Definitions and Symbols

The following terms and symbols are used in this documentation and also appear on the product where safety-related issues occur.

General Warning or Caution

The exclamation symbol may appear in warning and caution tables in this document. This symbol designates an area where personal injury or damage to the equipment is possible.

The following are definitions of the Warnings, Cautions and Notes that may be used in this manual to call attention to important information regarding personal safety, safety and preservation of the equipment, or important tips.

WARNING

Warning indicates a potentially dangerous situation which can result in bodily harm or death.

CAUTION

Caution indicates a potentially hazardous situation which can result in damage to product or equipment.

NOTE

Note indicates additional information that must be considered by the user or operator.

European Union CE Mark

The presence of the CE Mark on Newport Corporation equipment means that it has been designed, tested and certified as complying with all applicable European Union (CE) regulations and recommendations.

Warnings and Cautions

ATTENTION

This stage is a Class A device. In a residential environment, this device can cause electromagnetic interference. In this case, suitable measures must be taken by the user.

Warnings

WARNING

The motion of objects of all types carries potential risks for operators. Ensure the protection of operators by prohibiting access to the dangerous area and by informing the personnel of the potential risks involved.

WARNING

Do not use this stage when its motor is emitting smoke or is unusually hot to the touch or is emitting any unusual odor or noise or is in any other abnormal state.

Stop using the stage immediately, switch off the motor power and then disconnect the electronics power supply.

After checking that smoke is no longer being emitted contact your Newport service facility and request repairs. Never attempt to repair the stage yourself as this can be dangerous.

WARNING

Make sure that this stage is not exposed to moisture and that liquid does not get into the stage.

Nevertheless, if any liquid has entered the stage, switch off the motor power and then disconnect the electronics from power supply.

Contact your Newport service facility and request repairs.

WARNING

Do not insert or drop objects into this stage, this may cause an electric shock, or lock the drive.

Do not use this stage if any foreign objects have entered the stage. Switch off the motor power and then disconnect the electronics power supply.

Contact your Newport service facility for repairs.

WARNING

Do not place this stage in unstable locations such as on a wobbly table or sloping surface, where it may fall or tip over and cause injury.

If this stage has been dropped or the case has been damaged, switch off the motor power and then disconnect the electronics power supply.

Contact your Newport service facility and request repairs.

WARNING

Do not attempt to modify this stage; this may cause an electric shock or downgrade its performance.

WARNING

Do not exceed the usable depth indicated on the mounting holes (see section “Dimensions”). Longer screws can damage the mechanics or cause a short-circuit.

Cautions

CAUTION

Do not place this stage in a hostile environment such as X-Rays, hard UV,… or in any vacuum environment.

CAUTION

Do not place this stage in a location affected by dust, oil fumes, steam or high humidity. This may cause an electric shock.

CAUTION

Do not leave this stage in places subject to extremely high temperatures or low temperatures. This may cause an electric shock.

- **Operating temperature: +10 to +35 °C**
- **Storage temperature: -10 to +40 °C (in its original packaging)**

CAUTION

Do not move this stage if its motor power is on.

Make sure that the cable to the electronics is disconnected before moving the stage. Failure to do so may damage the cable and cause an electrical shock.

CAUTION

Be careful that the stage is not bumped when it is being carried. This may cause it to malfunction.

CAUTION

When handling this stage, always unplug the equipment from the power source for safety.

CAUTION

When the carriage is in its end-of-run position, it is strongly recommended not to go beyond this point as this may damage the stage mechanism.

CAUTION

Contact your Newport service facility to request cleaning and specification control every year.

High-Speed Precision Rotation Stage RGV100BL

1.0 Introduction

This manual provides operating instructions for the RGV100BL high-speed precision rotation stage.

RGV100BL precision rotation stage.

RECOMMENDATION

We recommend you read carefully the chapter “Connection to electronics” before using the RGV160BL rotation stage.

2.0 Description

The RGV100BL is a very compact direct-drive rotation stage that provides ultra-fast rotation with very high resolution and outstanding positioning performance. Applications include semiconductor wafer inspection, micro-robotics, and precision metrology.

The direct-drive technology of the RGV100BL eliminates the worm gear of traditional rotation stages. The advantages are higher speeds, superior reliability, and enhanced position sensitivity. Speed, resolution, and repeatability are increased by a factor of up to ten times compared to worm-driven rotation stages of the same size. A high efficiency brushless DC torque motor with rare earth magnets supplies an optimum ratio of torque per inertia for high acceleration, with minimal stage heating. At maximum continuous torque, the temperature of the motor increases by only 30 °C. This is significantly less than with other stage designs and guarantees high performance and high reliability for the most demanding applications.

Precision is ensured by a high-resolution glass scale with 15,000 line pairs per revolution that directly measures the position of the rotating platen. The flat encoder is mounted on a precision ground reference surface and is perfectly aligned with the stage's rotation axis to minimize position errors induced by eccentricity, wobble, or axial runout. The encoder signals are interpolated by Newport's XPS motion controller with less than 0.1 arcsec resolution for outstanding position sensitivity and stability.

The RGV100BL features a proprietary 4-point contact ball bearing. This unique, 2-piece design takes the full benefit of Newport's excellent capabilities in the design, manufacturing and assembly of precision mechanics and integrates multiple functions, the bearing ways and the direct drive motor into a minimum number of parts. The result is a more compact rotation stage with superior stiffness, high reliability and outstanding wobble and eccentricity.

A 30 mm diameter through-hole allows convenient routing of cables and vacuum lines through the stage. A once-per revolution index pulse permits precision homing to a unique home position. The RGV100BL also features two limit switches that can be enabled or disabled by an external switch.

2.1 Design Details

Base Material	Aluminum
Bearings	Large diameter steel ball bearings
Motor	High-torque brushless DC motor with rare earth magnets
Motor Initialization	Using a patented process that avoids major motion during initialization and that does not require Hall effect sensors
Motor Commutation	Done by the XPS controller on encoder signals
Feedback	Glass scale encoder with 15,000 line pairs per revolution, 1 V_{PP}, 32768-fold signal subdivision when used with XPS controller
Limit Switches	Two optical limit switches at approx. ±168°, disabled by external switch
Origin	Optical, fixed at position 0°, including mechanical zero signal
Cable Length (m)	5 (included

RoHS Compliant

NOTE

This product complies with the RoHS directive (Restriction of Hazardous Substances).

3.0 Characteristics

3.1 Definitions

Specifications of our products are established in reference to ISO 230 standard part II “Determination of accuracy and repeatability of positioning numerically controlled axes”.

This standard gives the definition of position uncertainty which depends on the 3 following parameters:

(Absolute) Accuracy

Difference between ideal position and real position.

On-Axis Accuracy

Difference between ideal position and real position after the compensation of linear errors.

Linear errors include: cosine errors, inaccuracy of screw or linear scale pitch, angular deviation at the measuring point (Abbe error) and thermal expansion effects. All Newport motion electronics can compensate for linear errors.

The relation between absolute accuracy and on-axis accuracy is as follows:

$$Absolute\ Accuracy = On\text{-}Axis\ Accuracy + Correction\ Factor_{x}\ Travel$$

Repeatability

Ability of a system to achieve a commanded position over many attempts.

Reversal Value (Hysteresis)

Difference between actual position values obtained for a given target position when approached from opposite directions.

Minimum Incremental Motion (MIM or Sensitivity)

The smallest increment of motion a device is capable of delivering consistently and reliably.

Resolution

The smallest increment that a motion device can theoretically move and/or detect. Resolution is not achievable, whereas MIM, is the real output of a motion system.

Eccentricity

Displacement of the geometric center of a rotation stage from the rotation axis in the plane defined by bearings.

Wobble

Tilt of rotation axis during rotation of a stage, measured on a reference surface.

The testing of on-axis accuracy, repeatability, and reversal error are made systematically with test equipment in an air-conditioned room ($20^{\pm 1}$ °C).

A linear cycle with 21 data points on the travel and 4 cycles in each direction gives a total of 164 points.

Guaranteed Specifications

Guaranteed maximum performance values are verified per Newport's A167 metrology test procedure. For more information, please consult the metrology tutorial section in the Newport catalog or at **www.newport.com**

3.2 Mechanical Specifications

Travel Range (°)	360 continuous
Minimum Incremental Motion (°)	0.00011
Uni-directional Repeatability[1] (°)	0.0003
Bi-directional Repeatability[1] (°)	0.0011 or ±0.00055
Absolute Accuracy[1] (°)	0.01 or ±0.005
Maximum Speed [no load] (°/s)	720
Maximum Acceleration (°/s²)	1000
Inertia [no load] (kg.m²)	0.00104
Wobble[1][2] (µrad)	20 ±10
Eccentricity[1] (µm)	3 ±1.5
MTBF (h)	20,000 with 5 kg load, 720 °/s speed and a duty cycle of 30%
Travel Range (mm)	

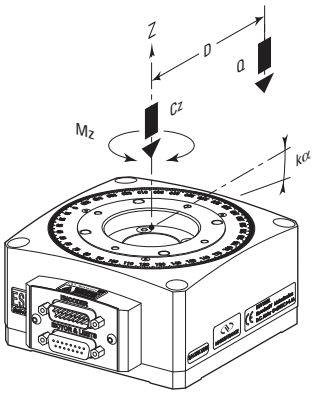
1) *Shown are peak to peak, guaranteed specifications or ±half the value as sometimes shown. For the definition of typical specifications which are about 2X better than the guaranteed values, visit www.newport.com for the Motion Control Metrology Primer.*

2) *To obtain arcsec units, divide µrad value by 4.8.*

CAUTION

To reach specifications stated, stages must be fixed on a plane surface with a flatness of 5 µm.

3.3 Load Characteristics and Stiffness



Cz, Normal centered load capacity	100 N
Kα, Transversal compliance	15 µrad/Nm
Mz, Maximum torque	0.42 Nm @ 0 °/s
Jz, Maximum Inertia	0.032 kg.m²
Q, Off-center load (N)	Q ≤Cz ÷ (1 + D/35) and Q ≤(Jz - Jq)/D2
Where D = Cantilever distance (mm)	
Jq = Inertia of payload	

CAUTION

When a RGV100BL rotation stage is integrated in an assembly or in a system, vibrating events due to the rotation of an off-center load at a high speed must be taken into account.

These event amplitudes damage RGV100BL rotation stage specifications, or damage assembly or system specifications.

3.4 Stage Weight

The stage weight below does not include the cables.

	Weight [lb (kg)]
RGV100BL	4.8 (2.6)
5-meter encoder cable	0.84 (0.38)
5-meter motor cable	1.72 (0.78)

4.0 Drive

The RGV100BL rotation stage is equipped with a DC-motor and a glass optical disk.

Specifications

	Commandable Resolution (°)	Max. Speed (°/s)	Max. Ambient Temperature (°C)	Motor
RGV100BL	0,00001	720	35	UE92BL

5.0 Motor

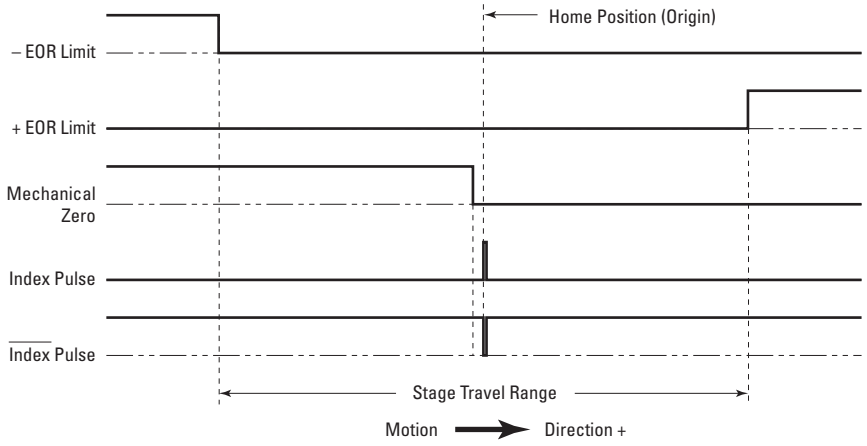
5.1 UE92BL DC-Motor Characteristics

Motor winding resistance terminal to terminal	(Ω)	10.4
Motor winding inductance terminal to terminal	(H)	0.00951
Motor constant or steepness [*MotorS*]	($N^2.m^2/W$)	0.0117
Motor thermal time constant [*MotorTauTH*]	(s)	3.301
Thermal resistance [*MotorRTH*]	(°C/W)	1.8
Motor torque constant [*Kt*]	(N.m/A)	0.426

5.2 Motor/Bearings Device Characteristics

Static friction torque [$C_{friction_{plat}}$]	(N.m)	0.12
Viscous friction torque factor	(N.m/rad/s)	Insignificant
Inertia of RGV100BL rotating part [$Inert_{plat}$]	($kg.m^2$)	0.00104
Max. inertia of the load in the rotation axis	($kg.m^2$)	0.031

5.3 Sensor Position



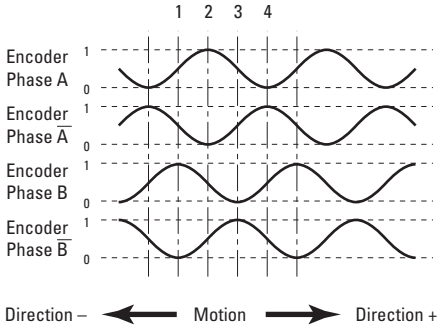
End-of-Run and Mechanical Zero are 5 V open collector type.

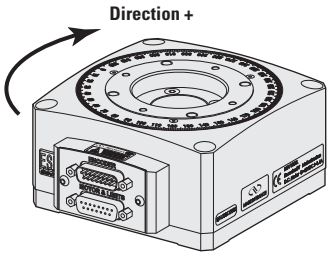
The Index Pulse provides a repeatable Home Position at ±1 step.

CAUTION

"End-of-Run" and "Mechanical Zero" are active signals and should not be connected to any other source.

5.4 Feedback Signal Position





The incremental sensor consists of a optical scale and an encoder head. When the carriages of the stage move, the encoder head generates square signals in quadrature, sent to pins #19, #20, #23 and #24 of the SUB-D25 connector.

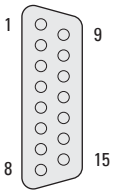
5.5 Pinouts

Sub-D connections for the RGV100BL rotation stage are given in the following tables:

Encoder Connector (SUB-D15M)

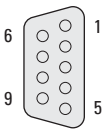
	Identical connection at both sides of the cable
1	Phase B
2	Shield Ground
3	Phase A
4	+5 V
5	N.C.
6	N.C.
7	/Index Pulse
8	N.C.
9	Phase /B
10	N.C.
11	Phase /A
12	N.C.
13	N.C.
14	Index Pulse
15	N.C.

Motor & Limits Connector (SUB-D15F)



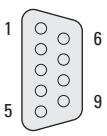
	Connection at RGV100BL size
1	N.C.
2	Phase V Motor
3	Mechanical Zero
4	– End-of-Run
5	Ground
6	N.C.
7	N.C.
8	N.C.
9	Phase W Motor
10	Phase U Motor
11	+ End-of-Run
12	N.C.
13	N.C.
14	N.C.
15	N.C.

SUB-D9M Connector of the Motor & Limits Cable



	Connection at controller size
1	Phase U Motor
2	N.C.
3	Phase V Motor
4	N.C.
5	N.C.
6	Phase W Motor
7	N.C.
8	Ground
9	N.C.

SUB-D9F Connector of the Motor & Limits Cable



	Connection at controller size
1	+ End-of-Run
2	– End-of-Run
3	Mechanical Zero
4	N.C.
5	N.C.
6	N.C.
7	N.C.
8	N.C.
9	N.C.

6.0 Connection to Newport Controllers

6.1 Warnings on Controllers

Controllers are intended for use by qualified personnel who recognize shock hazards and are familiar with safety precautions required to avoid possible injury. Read the controller user's manual carefully before operating the instrument and pay attention to all written warnings and cautions.

WARNING

Disconnect the power plug under the following circumstances:

- **If the power cord or any attached cables are frayed or damaged in any way.**
- **If the power plug is damaged in any way.**
- **If the unit is exposed to rain, excessive moisture, or liquids are spilled on the unit.**
- **If the unit has been dropped or the case is damaged.**
- **If you suspect service or repair is required.**
- **Whenever you clean the electronics unit.**

CAUTION

To protect the unit from damage, be sure to:

- **Keep all air vents free of dirt and dust.**
- **Keep all liquids away from the unit.**
- **Do not expose the unit to excessive moisture (85% humidity).**
- **Read this manual before using the unit for the first time.**

WARNING

All attachment plug receptacles in the vicinity of this unit are to be of the grounding type and properly polarized.

Contact your electrician to check your receptacles.

WARNING

This product is equipped with a 3-wire grounding type plug.

Any interruption of the grounding connection can create an electric shock hazard.

If you are unable to insert the plug into your wall plug receptacle, contact your electrician to perform the necessary alterations to ensure that the green (green-yellow) wire is attached to earth ground.

WARNING

This product operates with voltages that can be lethal.

Pushing objects of any kind into cabinet slots or holes, or spilling any liquid on the product, may touch hazardous voltage points or short out parts.

6.2 Connection

On each stage is represented a label which indicates its name and its serial number.

WARNING

Always turn the controller's power OFF before connecting to a stage.

Stages may be connected to the rear panel motor connectors any time prior to power-up with the supplied cable assemblies.

NOTE

These stages are ESP compatible. Enhanced System Performance is Newport's exclusive technology that enables Newport ESP motion controllers to recognize the connected Newport ESP stage and upload the stage parameters. This ensures that the user can operate the motion system quickly and safely.

6.3 Cables

Our RGV100BL rotation stage is delivered equipped with a set of two 5-meter cables. It can be directly connected to our XPS controller.

WARNING

The RGV100BL rotation stage operates only with 5-meter max. cables.

WARNING

These cables are shielded correctly. For a correct operation, make sure to lock connectors (ground continuity provided by the cable).

WARNING

Keep the motor cable at a safe distance from other electrical cables in your environment to avoid potential cross talk.

6.4 Configuration

To configure the XPS controller with the RGV100BL rotation stage, please refer to the XPS user's manual.

IMPORTANT

For optimum performance, it is important to configure the XPS controller with the weight/inertia on the RGV100BL rotation stage. To do that, please log-in to the XPS controller as Administrator.

Go to the tab TUNING, select the RGV100BL positioner. Do the auto-scaling which sets the ScalingAcceleration and AccelerationLimit in the stages.ini file according to your payload/inertia.

In case of auto-scaling process failure, you may set manually these values. Please refer to chapter 7.2.

7.0 Connection to Non-Newport Electronics

7.1 Connections

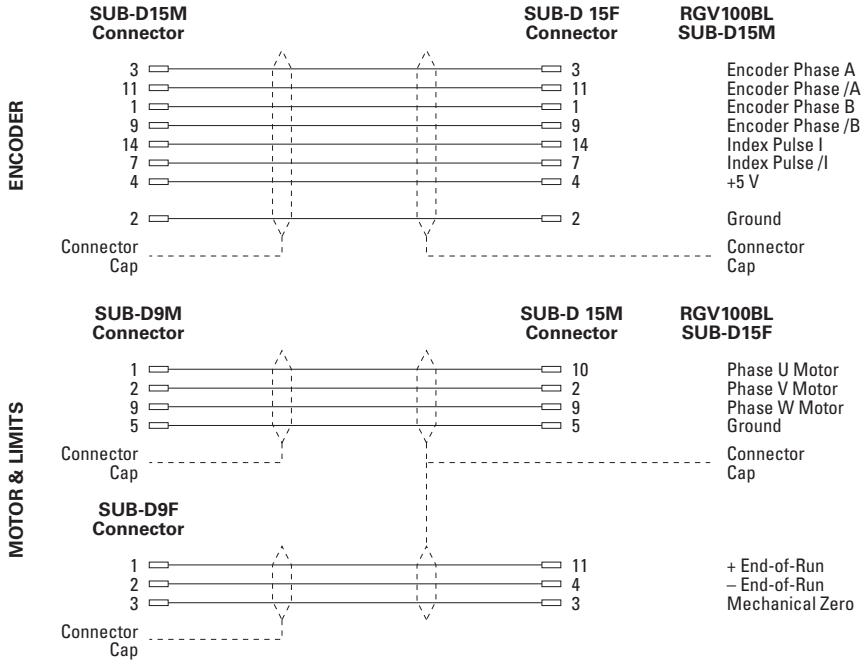
WARNING

Newport is not responsible for malfunction or damage to a RGV160BL stage when it is used with non- Newport controllers.

WARNING

Newport guarantees "CE" compliance of the RGV160BL stage only if they are used with Newport cables and controllers.

Nevertheless, the figure below shows the wiring when a RGV160BL stage is used with non-Newport controllers.



7.2 Configuration

The installation of a direct drive, acceleration driven, stage is a two steps process:

① Driver configuration.

② Controller configuration.

7.2.1 Driver Configuration

The two driver parameters to configure are:

- The maximum average (RMS) driver current: *DriverMaximumRMSCurrent*
  => maximum average (RMS) amount of current that the driver can deliver to the motor.

WARNING

This functionality does not exist on every driver in the marketplace.

- The maximum instantaneous driver current: *DriverMaximumPeakCurrent*
  => maximum instantaneous amount of current that the driver can deliver to the motor.

IMPORTANT

The stage RGV100BL is designed for a maximum motor winding temperature elevation of 30 °C. It is mandatory to respect this limit for fear to downgrade the performances or to damage the stage.

Motor data

- Motor constant (or Steepness): *MotorS* [$N^2.m^2/W$]
- Motor torque constant: *Kt* [$N.m/A_{rms}$]
- Motor thermal resistance: *MotorRTH* [K/W]
- Motor thermal time constant: *MotorTauTH* [s]

Driver data

- Maximum driver output current: *DriverMaxOutputCurrent*

Intermediate calculation

- Maximum value of the average (RMS) torque at 30 °C temperature elevation:

$$C_{RMS}(30) = \sqrt{\frac{30 \times MotorS}{MotorRTH \times (1 + 0.004 \times 30)}} \quad [N.m]$$

***DriverMaximumRMSCurrent* calculation**

$$DriverMaximumRMSCurrent = C_{RMS} . \frac{\sqrt{2}}{Kt} \quad [A]$$

IMPORTANT

For the RMS averaging process on the driver current, you must use a time constant inferior or equal to the motor thermal time constant *MotorTauTH*.

Here is an example for a 30 °C temperature elevation:

with (see chapter 5.0):

MotorS = 0.0117 $N^2.m^2/W$
MotorRTH = 1.8 °C/W
Kt = 0.426 $N.m/A_{rms}$

we calculate:

$C_{rms}(30)$ = 0.417 N.m
***DriverMaximumRMSCurrent* = 1.38 A**

***DriverMaximumPeakCurrent* Calculation**

First intermediate calculation:

MaxInstCurrent = 2 x DriverMaximumRMSCurrent

Remark: This coefficient 2 was determined by Newport with regards to the optimum acceleration profiles used for Motion Control. This coefficient allows delivering an instantaneous current to the motor in order to obtain in parallel an high short term acceleration and a high long term acceleration with respect to the thermal elevation constraint.

In case of exceeding, the XPS-DRV02 driver generate a security stop.

Second intermediate calculation:

DriverMaximumPeakCurrent = 1.1 x MaxInstCurrent

Remark: This 1.1 coefficient comes from a Newport 10% security margin in case of, during transitional phases, the instantaneous current delivered to the motor reach the maximum output driver current.

In that case, the Newport XPS-DRV02 driver generate a security stop.

Then:

DriverMaximumPeakCurrent = 2.2 x DriverMaximumRMSCurrent	[A]

Knowing the average (RMS) force that you need to apply, you can verify the balance between this need and the maximum average (RMS) current then maximum instantaneous current that your driver is capable to deliver.

IMPORTANT

Systematically verify:

DriverMaximumPeakCurrent* ≤ *DriverMaxOutputCurrent

Then, following the same example as above,

we calculate:

***DriverMaximumPeakCurrent* = 3.04 A**

7.2.2 Controller Configuration

The two controller parameters to configure are:

- The full scale acceleration: *ScalingAcceleration*

  => theoretical acceleration corresponding to the full scale controller command.
- The maximum authorized acceleration: *AccelarationLimit*

  => maximum acceleration authorized by the controller.

WARNING

The AccelarationLimit functionality does not exist on every driver in the marketplace.

Driver data

- Transimpedance: *Z* [A/V]
- The maximum instantaneous driver current: *DriverMaximumPeakCurrent* [A]

Remark: In case of use Newport XPS-DRV02 driver, Z = 5/10 [A/V]. To know *DriverMaximumPeakCurrent* please refer to the stages.ini XPS file.

Controller data

- Full scale of the command: *Vscaling* [V]

Remark: In the case of use Newport XPS controller: *Vscaling* = 10 [V]

Motor data

- Motor force torque constant: *Kt* [N.m/A_{rms}]

Stage data

- Moving inertia at no payload: $Inert_{plat}$ [kg.m^2]
- Static friction: $C_{friction_{plat}}$ [N.m]

Remark: For our stage RGV100BL, the viscous friction is negligible compared to the static friction.

Application data

- Payload: $Inert_{payload}$ [kg.m^2]
- Static friction: $C_{friction_{app}}$ [N.m]

Remark: We to not consider viscous friction for that configuration process. In case of viscous friction can't be neglicted, please contact Newport for support.

***ScalingAcceleration* calculation**

Intermediate calculation of the maximum torque that the motor can deliver:

$$C_{motor_{\max}} = Z.Vscaling.\frac{Kt}{\sqrt{2}} \text{ [N.m]}$$

$$ScalingAcceleration = \frac{C_{motor_{\max}} - \left(C_{friction_{plat}} + C_{friction_{app}}\right)}{Inert_{plat} + Inert_{payload}} \text{ [rad/s}^2\text{]}$$

Here is an example for the XPS controller and the XPS-DRV02 driver:

with:

Z = 0.5 A/V
$V_{scaling}$ = 10 V
Kt = 0.426 N.m/A_{rms}

and:

$Inert_{plat}$ = 0.00104 kg.m² (see chapter 5.0)
$C_{friction_{plat}}$ = 0.12 N.m (see chapter 5.0)
$Inert_{payload}$ = 0.0200 kg.m²
$C_{friction_{app}}$ = 0 N.m

we calculate:

$C_{motor_{max}}$ = 1.51 N.m

***ScalingAcceleration* = 66.06 rad/s² = 3785.22 °/s²**

***AccelerationLimit* calculation**

Intermediate calculation of the maximum torque that the motor is susceptible to deliver:

$$C_{motor_{limit}} = \frac{DriverMaximumPeakCurrent}{1{,}1} . \frac{Kt}{\sqrt{2}} \text{ [N.m]}$$

Remark: This 1.1 coefficient comes from a Newport 10% security margin in case of, during transitional phases, the instantaneous current delivered to the motor reach the maximum output driver current.

In that case, the Newport XPS-DRV02 driver generate a security stop.

$$AccelerationLimit = \frac{C_{motor_{limit}} - \left(C_{friction_{stage}} + C_{friction_{app}}\right)}{Inert_{plat} + Inert_{payload}} \text{ [rad/s²]}$$

Then, following the same XPS and XPS-DRV02 example as above,

with:

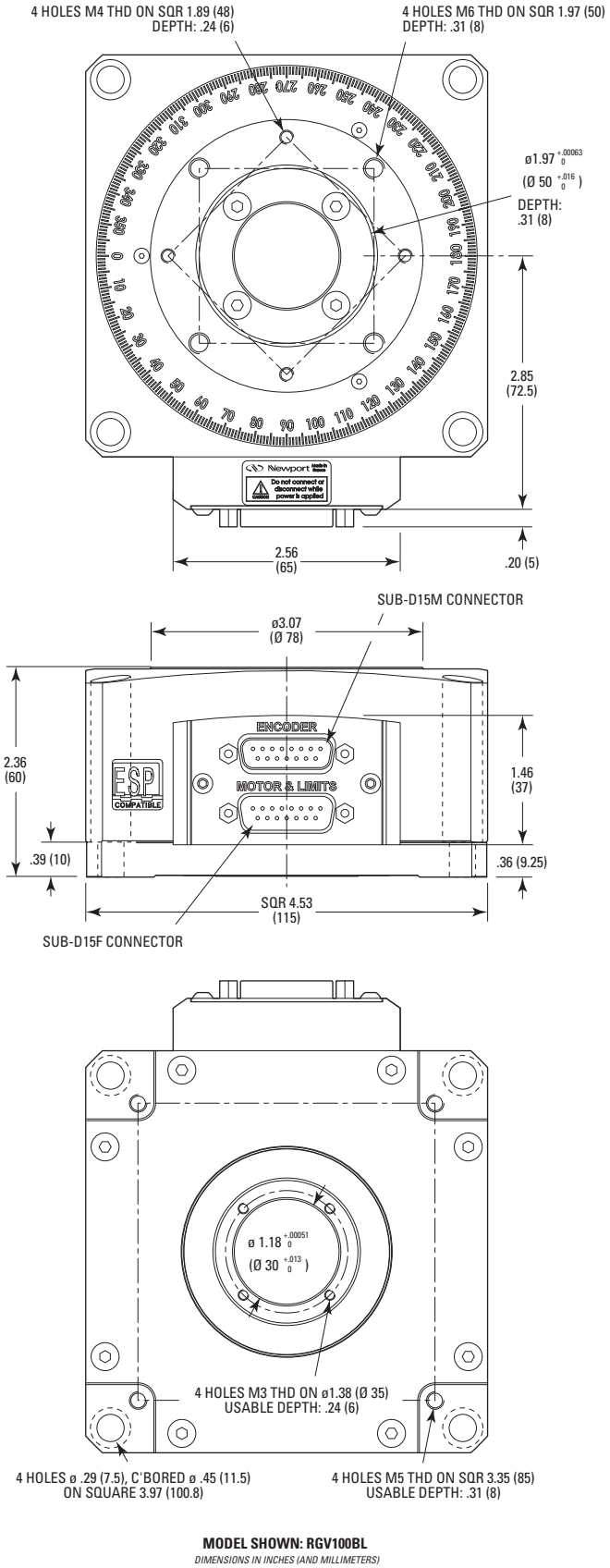
DriverMaximumPeakCurrent = 3.11 A

we calculate:

$C_{motor_{limit}}$ = 0.83 N.m

AccelerationLimit = 33.75 rad/s² = 1933.46 °/s²

8.0 Dimensions



MODEL SHOWN: RGV100BL

DIMENSIONS IN INCHES (AND MILLIMETERS)

CAUTION

Mounting holes of the RGV100BL upper interface are clearance holes. Make sure that:

- **fixing screw lengths of the driven load do not exceed the usable depth indicated on the mounting holes;**
- **any object does not get into the internal mechanism of the stage through these mounting holes;**

this may damage the rotation stage.

CAUTION

To reach the specifications stated, it is necessary to meet the following using conditions:

- **the flatness of the load mounting surface must be ≤10 µm;**
- **the RGV100BL rotation stage must be fixed on a plane surface with a flatness ≤10 µm.**

9.0 Maintenance

RECOMMENDATION

It is recommended to contact our After Sales Service which will know to define the appropriate maintenance for your application.

9.1 Maintenance

The RGV160BL stage requires no particular maintenance. Nevertheless, this is a precision mechanical device that must be kept and operated with caution.

PRECAUTIONS

The RGV160BL stage must be used or stocked in a clean environment, without dust, humidity, solvents or other substances.

RECOMMENDATION

It is recommended to return your RGV160BL stage to Newport's After Sales Service after every 2000 hours of use for lubrication.

If your stage is mounted on a workstation and cannot be easily removed, please contact Newport's After Sales Service for further instructions.

9.2 Repair

CAUTION

Never attempt to disassemble a component of the stage that has not been covered in this manual.

To disassemble a non specified component can cause a malfunction of the stage.

If you observe a malfunction in your stage, please contact us immediately to arrange for a repair.

CAUTION

Any attempt to disassemble or repair a stage without prior authorization will void your warranty.

9.3 Calibration

CAUTION

It is recommended to return your RGV160BL stage to Newport once a year for recalibration to its original specifications.

Service Form

Your Local Representative
Tel.: _____
Fax: _____

Name: _____ Return authorization #: _____
(Please obtain prior to return of item)

Company: _____

Address: _____ Date: _____

Country: _____ Phone Number: _____

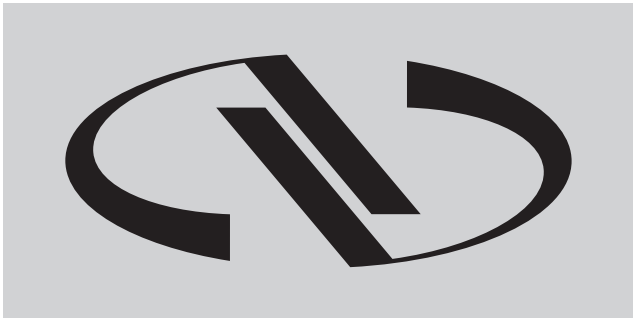
P.O. Number: _____ Fax Number: _____

Item(s) Being Returned:

Model #: _____ Serial #: _____

Description: _____

Reasons of return of goods (please list any specific problems): _____



Newport®

Experience | Solutions

Visit Newport Online at:
www.newport.com

North America & Asia

Newport Corporation

1791 Deere Ave.
Irvine, CA 92606, USA

Sales

Tel.: (800) 222-6440

e-mail: sales@newport.com

Technical Support

Tel.: (800) 222-6440

e-mail: tech@newport.com

Service, RMAs & Returns

Tel.: (800) 222-6440

e-mail: service@newport.com

Europe

MICRO-CONTROLE Spectra-Physics S.A.S

9, rue du Bois Sauvage
91055 Évry CEDEX
France

Sales & Technical Support

Tel.: +33 (0)1.60.91.68.68

e-mail: france@newport.com

Service & Returns

Tel.: +33 (0)2.38.40.51.55